remote node or terminal, including equipment in below-ground controlled environmental vaults and above ground pedestals; (iii) intra-loop multiplexing/aggregation/routing equipment; and (iv) feeder cable.

(d) *Interoffice Transmission Facilities.*

(1) Interoffice transmission facilities include:

(i) Dedicated transport, defined as incumbent LEC transmission facilities, at any standard level, including but not limited to DS1, DS3 and OCn levels, dedicated to a particular customer or carrier, that provide telecommunications between wire centers owned by incumbent LECs, requesting telecommunications carriers, or third-party providers, or between switching, routing or multiplexing facilities owned by incumbent LECs, requesting telecommunications carriers, or third-party providers. This unbundling obligation includes "entrance facilities" between ILEC end offices and a requesting telecommunications carrier's point of presence and "dark fiber" (optical fiber with no electronics attached) transmission facilities.

(2) The incumbent LEC shall:

(i) provide a requesting telecommunications carrier exclusive use of interoffice transmission facilities dedicated to a particular customer or carrier, or "derived capacity" via the use of the features, functions, and capabilities of interoffice transmission facilities shared by more than one customer or carrier, including the ILEC;

(ii) provide all technically feasible transmission facilities, features, functions, and capabilities, including, but not limited to, high capacity DS1, DS3 and OCn, and "dark fiber" (optical fiber with no electronics attached) transport facilities, that the requesting telecommunications carrier could use to provide telecommunications services;

(iii) permit, to the extent technically feasible, a requesting telecommunications carrier to connect such interoffice facilities to equipment designated by the requesting telecommunications carrier, including, but not limited to, the requesting telecommunications carrier's collocated facilities and equipment or facilities deployed at remote terminal or remote switching or remote multiplexing/aggregation/routing points;

(iv) permit, to the extent technically feasible, a requesting telecommunications carrier to obtain the functionality provided by the incumbent LEC's digital cross-connect systems in the same manner that the incumbent LEC provides such functionality to interexchange carriers, other incumbent LECs, other telecommunications providers, or information service providers;

(3) The interoffice transmission facilities network element shall include all cross-connects needed to connect it to other network elements provided by the incumbent LEC or the requesting telecommunications carrier.

(4) The incumbent LEC shall provide a requesting telecommunications carrier use of packet transport defined as the transport of packetized information between (and including) two or more packet devices, or between interconnected transmission facilities which terminate at a packet device, including any intermediate routing or switching, without regard to the protocol or packet definition scheme involved. The packet transport network element shall include all features, functions and capabilities of the incumbent LEC's packet transport network.

(f) *Operations Support Systems Functions*.

(2) An incumbent LEC shall provide nondiscriminatory, electronic access to information pertaining to the physical attributes and characteristics of loops, including, but not limited to loop type, length, conditioning, and the presence of intra-loop devices and facilities.

(**x**) *Extended Link.*

(1) The extended link is defined as a dedicated transmission path connecting an end user with a requesting telecommunications carrier's voice or data switch at the requesting telecommunications carrier's point of presence. Extended links may be comprised of intra-multi-tenant-environment wiring, network interface device, loop, multiplexing/aggregation/routing, and dedicated interoffice transmission facilities.

(2) Incumbent LECs must provide unbundled access to extended links incorporating any loop or transport type specified by the requesting telecommunications carrier.

(3) The extended link network element shall encompass all features, functions and capabilities of the underlying facilities deployed along the extended link transmission path. Where integrated digital loop carrier systems ("IDLC"), multiplexing/aggregation/routing or similar intra-extended link facilities are deployed, incumbent LECs shall provision extended links with such facilities incorporated.

(4) The extended link network element shall include all internal cross-connects as well as cross connects needed to connect it to other network elements provided by the incumbent LEC or the requesting telecommunications carrier.

(5) The extended link shall include intra-multi-tenant-environment wiring and the network interface device, unless the requesting telecommunications carrier requests otherwise.

(6) Incumbent LECs shall accommodate requesting telecommunications carriers' requests to convert special access links to extended links. Incumbent LECs may not impose charges for such conversions.

(**xx**) *Intra-Multi-Tenant-Environment Wiring.*

(1) IntraMTE wiring is defined as incumbent LEC owned wires and cables, in multi-tenant environments, including, but not limited to, vertical and horizontal riser cables.

(2) The intraMTE wiring network element shall include all cross-connects needed to connect it to other network elements provided by the incumbent LEC or the requesting telecommunications carrier.

(**xxx**) *Multiplexing/Aggregation/Routing Equipment or Functionality.*

(1) Multiplexing/aggregation/routing equipment or functionality is defined as any equipment or functionality deployed in an incumbent LEC end office or along a transmission path for the purpose of multiplexing, aggregating, concentrating or routing electronic, digital or optical signals.

(2) The multiplexing/aggregation/routing equipment network element shall

include all cross-connects needed to connect it to other network elements provided by the incumbent LEC or the requesting telecommunications carrier.

(**xxxx**) *Data Transmission and Interconnection Facilities.*

(1) Data transmission and interconnection facilities are defined to include ports on incumbent LEC data switches or routers and virtual circuits at a series of pre-defined bit rates between ports on incumbent LEC data switches. The virtual circuits shall be available in increments of 56 or 64 kbps, up to any technically feasible capacity.

(2) The data transmission and interconnection facilities element shall include all cross-connects needed to connect it to other network elements provided by the incumbent LEC or the requesting telecommunications carrier.

§ 51.503 General pricing standard.

(a) An incumbent LEC shall offer elements to requesting telecommunications carriers at rates, terms, and conditions that are just, reasonable, and nondiscriminatory.

(1) Disparities in an incumbent LEC's rates for the same or comparable network elements in different states that exceed 25 percent are presumptively unreasonable.

(2) Disparities in rates for the same or comparable network elements for different incumbent LECs that exceed 100 percent are presumptively unreasonable.

(3) State commissions must suspend and review all presumptively unreasonable rates, and order appropriate adjustments retroactive to the date on which the rates became unreasonable, as a result of an order of this Commission or any state commission. State commission rate determinations may be reviewed by the Commission on its own motion or on the motion of any interested party.

§ 51.507 General rate structure standard.

(g) State commissions shall establish volume and term discounts for network elements.

(h) Incumbent LECs shall not impose any charges for combining network elements.

§ 51.509 Rate structure standards for specific elements.

(a) *Local loops.* Loop costs shall be recovered through flat-rated charges. Incumbent LECs shall not impose any charges for conditioning loops. Incumbent LECs shall not impose special construction charges for meeting its loop unbundling obligations where integrated digital loop carrier systems have been deployed.

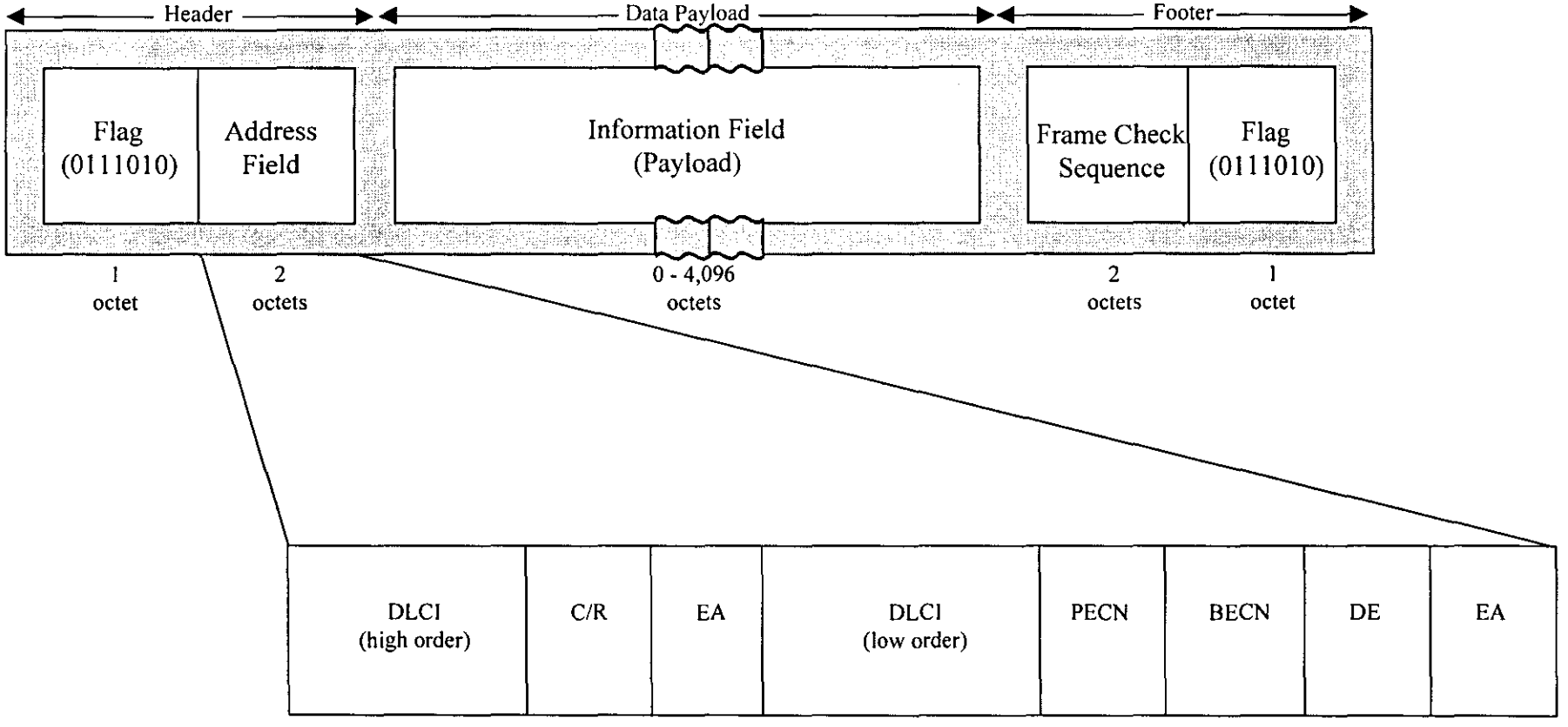
(c) *Dedicated transmission links.* Dedicated transmission links shall be recovered through flat-rated charges. Incumbent LECs shall not impose special construction charges for meeting its interoffice transport unbundling obligations, unless the incumbent LEC imposes comparable charges on its affiliates, interexchange carriers, other incumbent LECs, other telecommunications providers, information service providers, and end user interoffice transport customers.

e.spire / Intermedia
Frame Relay and Data UNEs

A Frame relay frame
B Getting to the first frame relay switch
C Frame relay - physical components
D PVCs and ILEC tariffed elements
E Frame relay on the OSI protocol stack
F Connecting frame relay networks to expand reach
G Frame relay interconnection
H How to get customer onto a CLEC's frame relay network
I Different delivery options lead to different pricing scenarios

September 2, 1999
e.spire / Intermedia *Ex Parte*
CC Docket No. 96-98

Frame Relay Frame



Octet = an 8 bit byte

DLCI	Data link connection identifier
C/R	Command/response field
FECN	Forward explicit congestion notification
BECN	Backward explicit congestion notification
DE	Discard eligibility
EA	Address field extension

Adapted from Newton's Telecom Dictionary

Diagram A

Getting to the First Frame Relay Switch

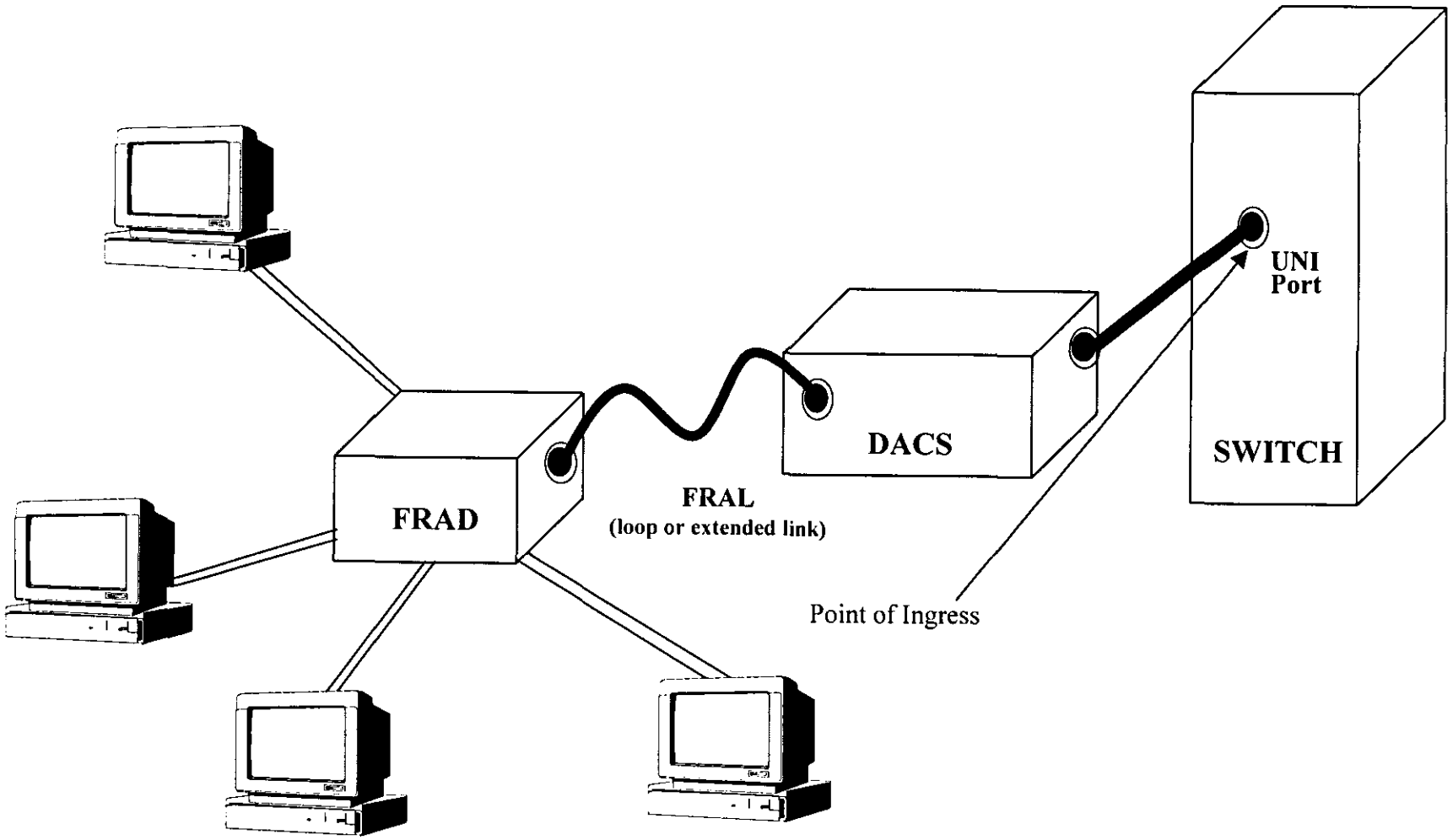


Diagram B

Frame Relay - Physical Components

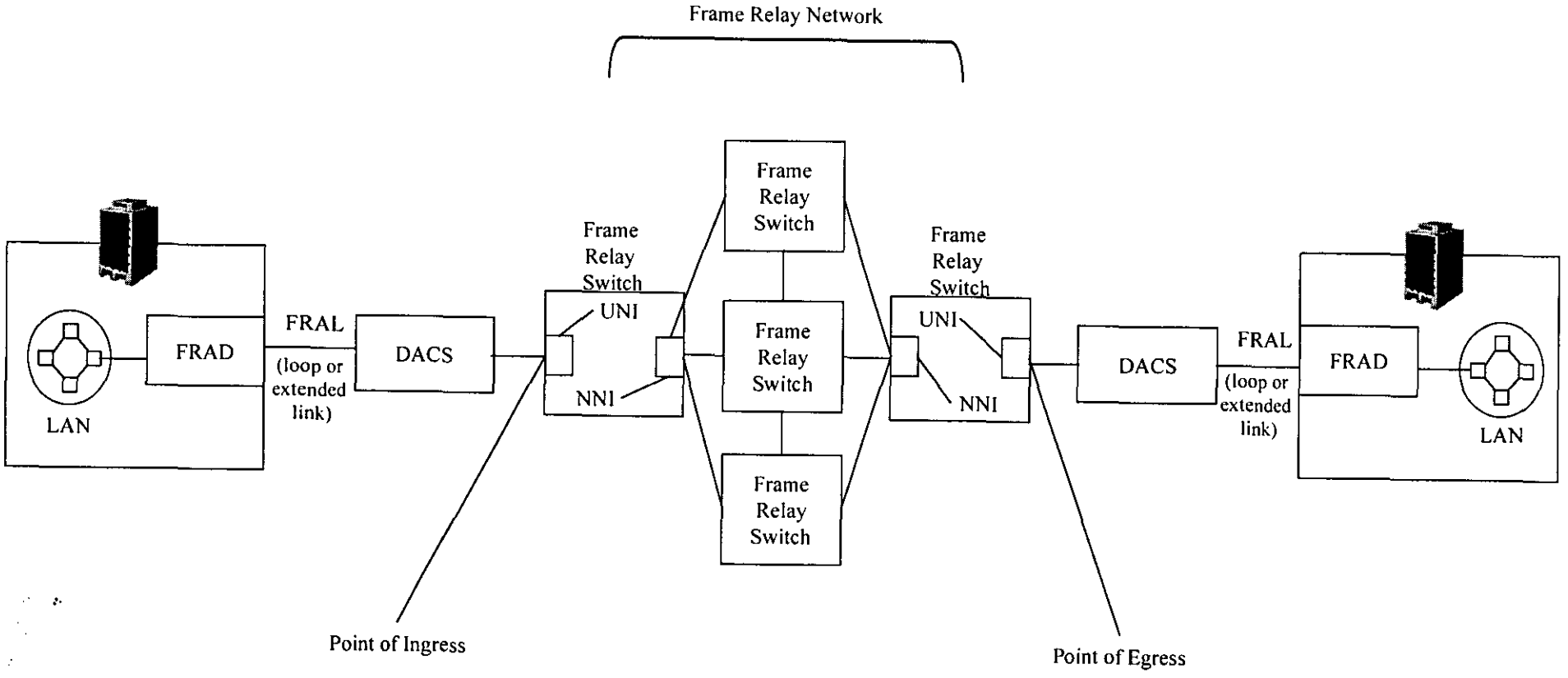


Diagram C

Frame Relay - PVCs and ILEC Tariff Elements

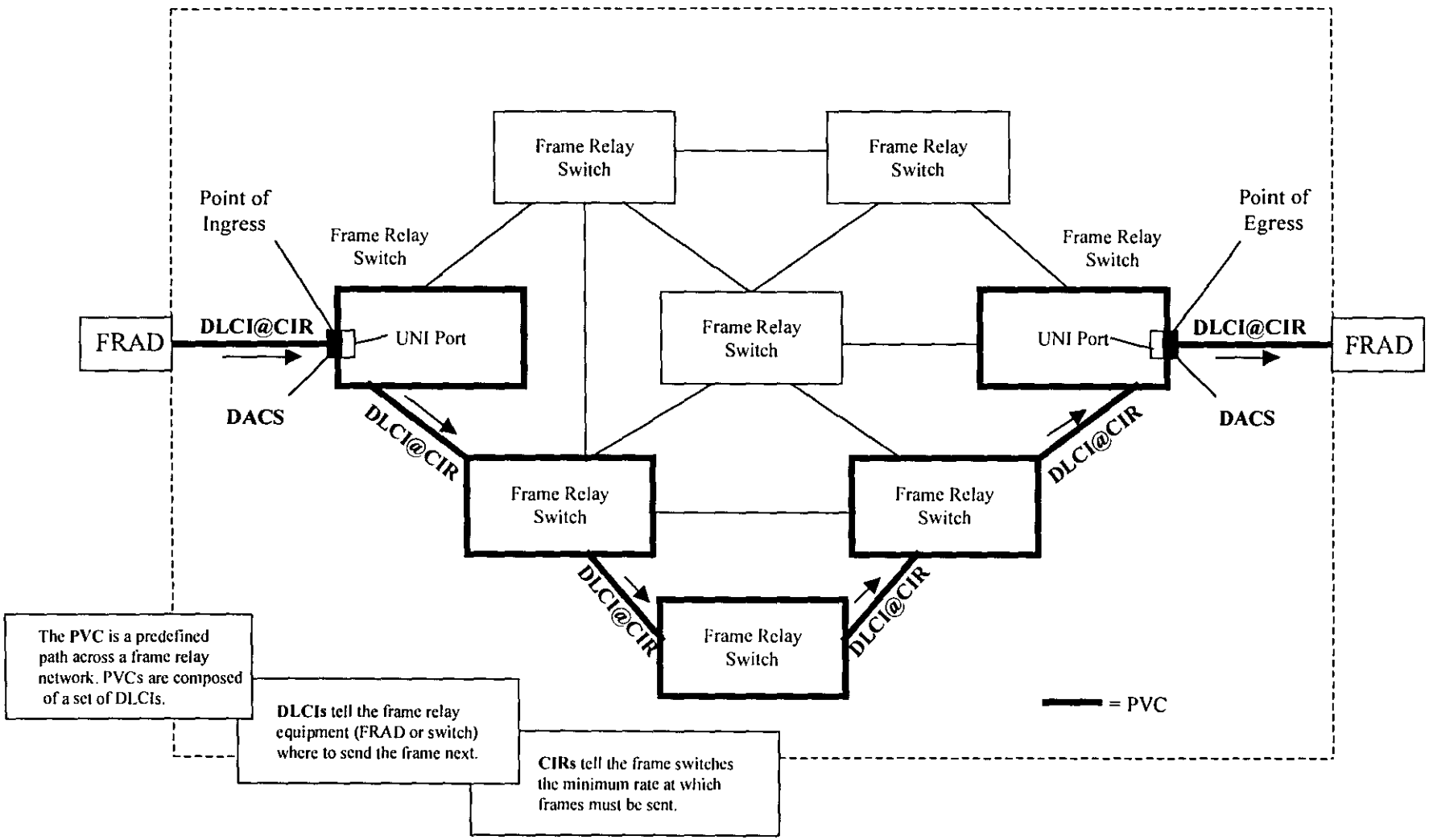
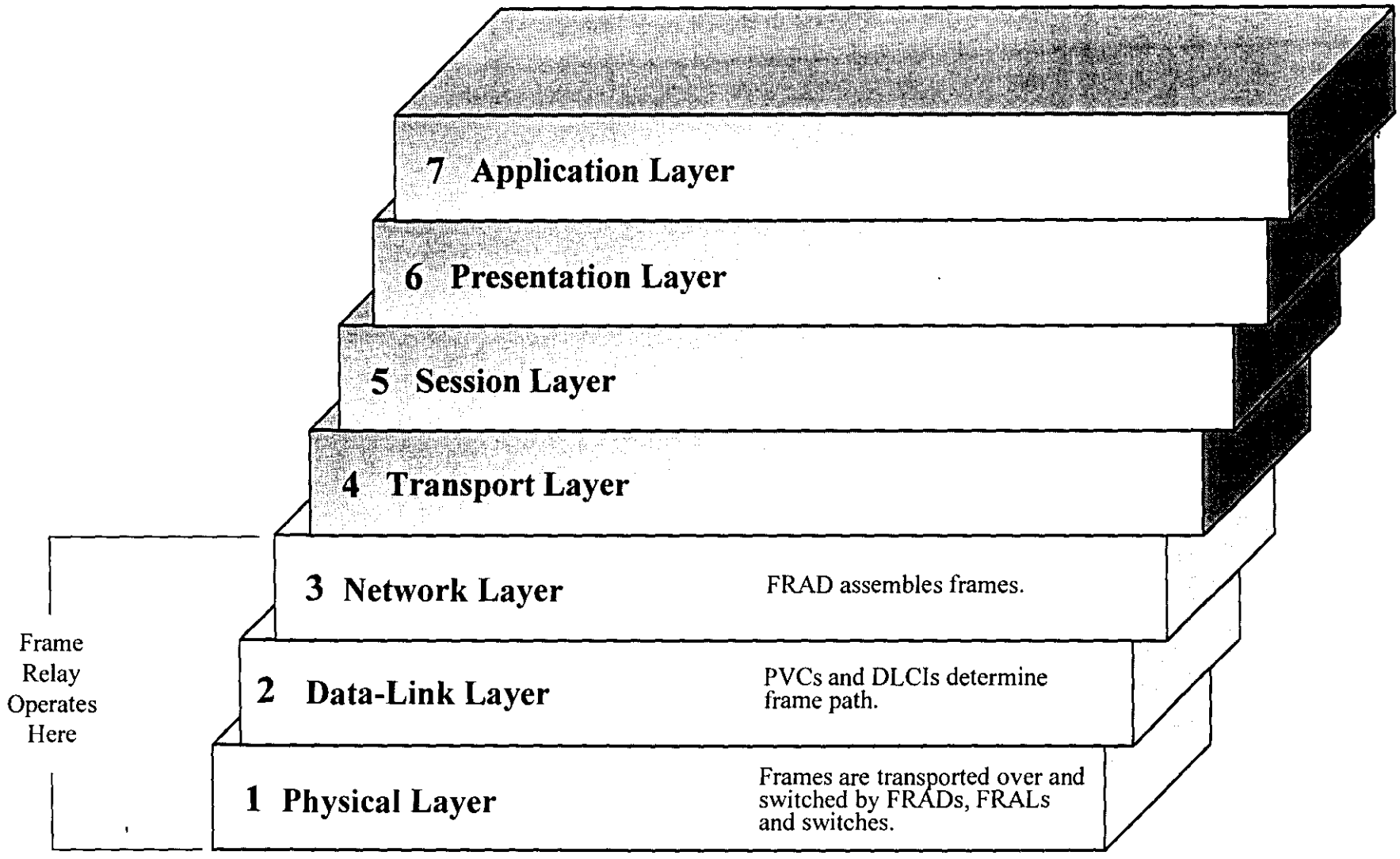


Diagram D

Frame Relay on the OSI Protocol Stack



Connecting Frame Relay Networks to Expand the Reach of ILEC and CLEC Networks

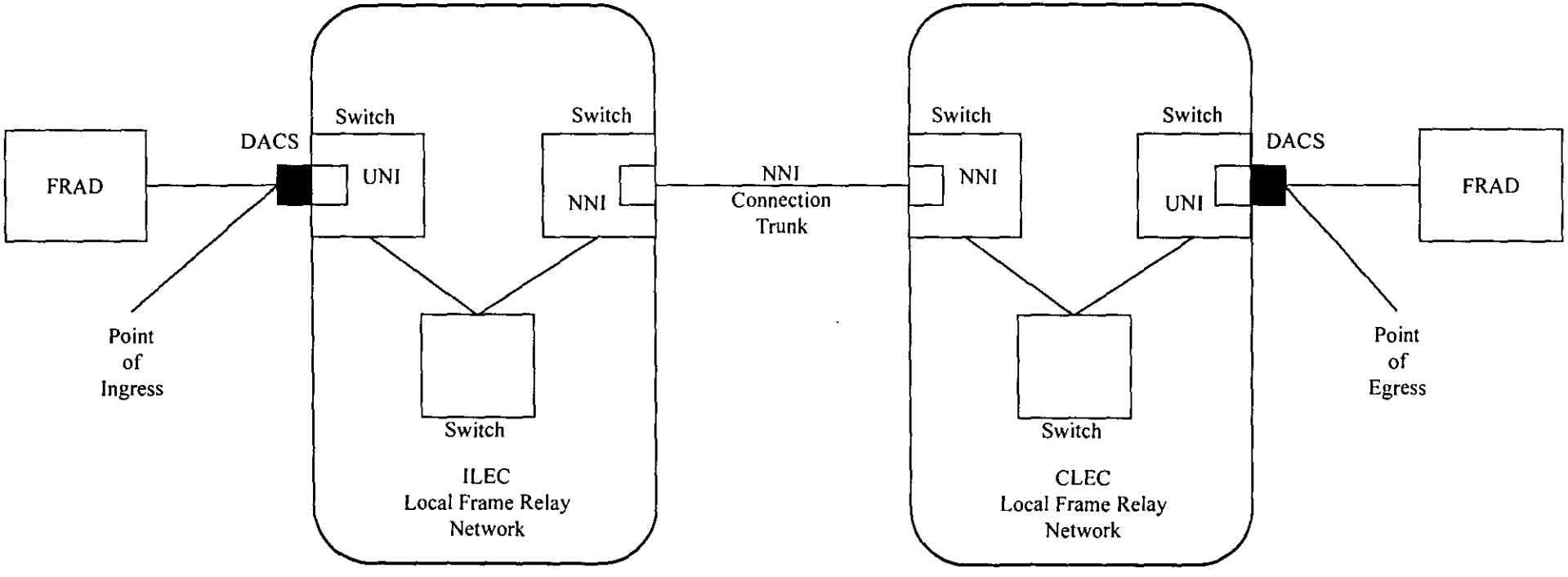
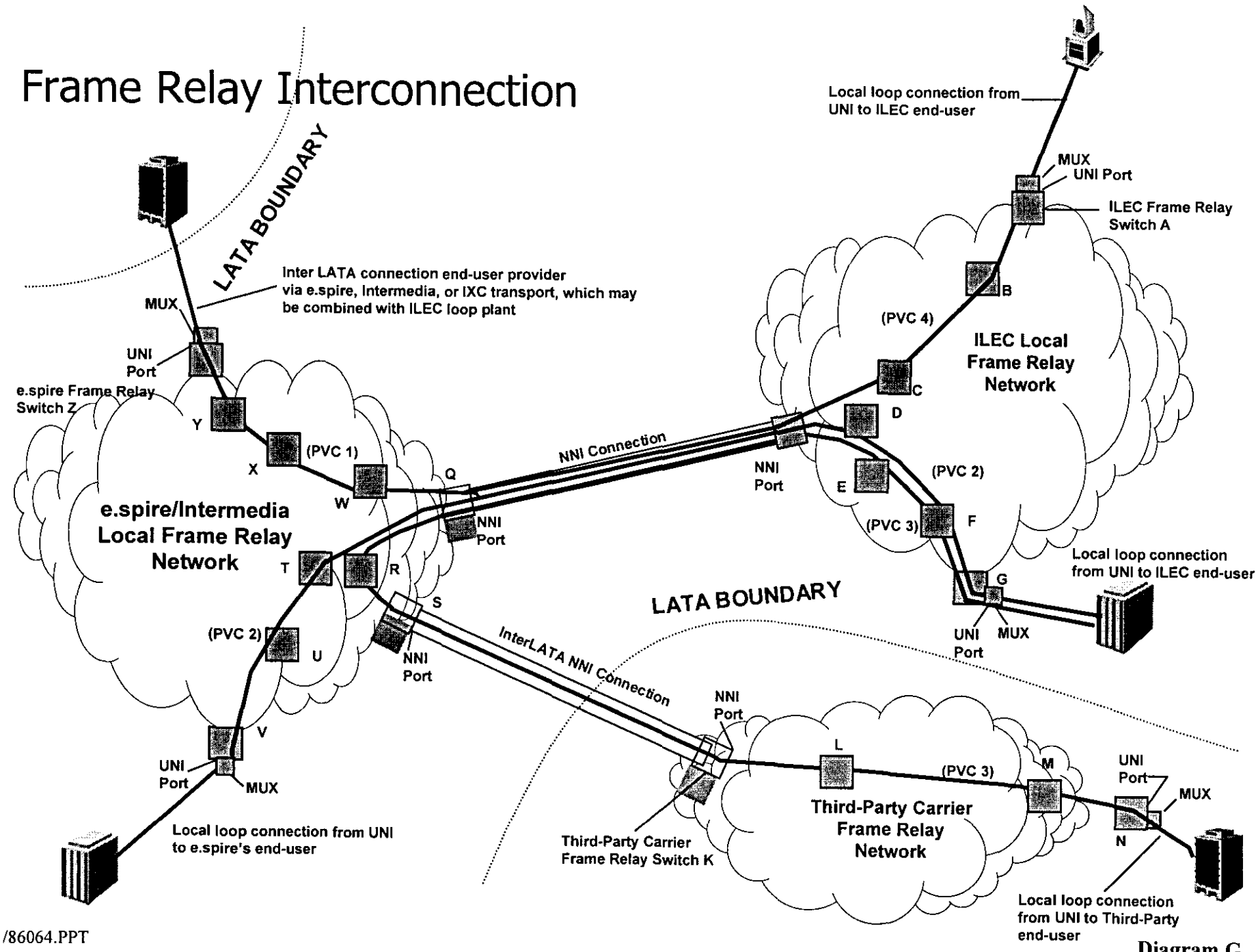


Diagram F

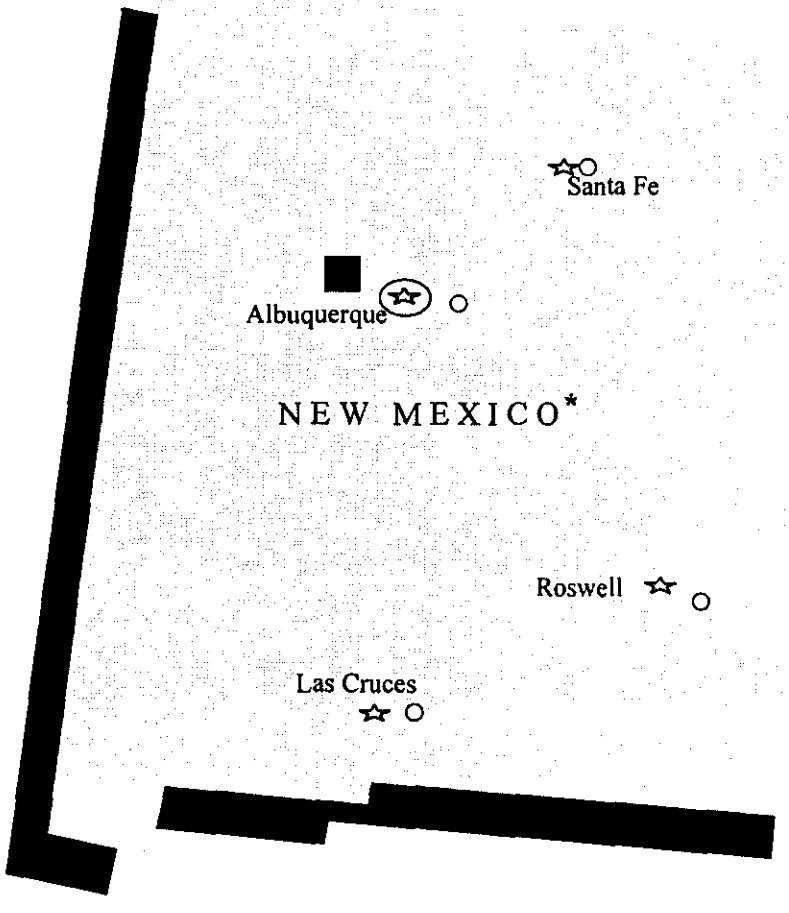
Frame Relay Interconnection



DC01/86064.PPT

Diagram G

How to get a frame relay customer onto a CLEC's frame relay network



For the customer's headquarters location, the connection is simply made by bringing the customer "on-net" (self-provisioning a loop) or by leasing a local loop UNE.

For the customer's LANs in outlying locations, a CLEC, in this case, e.spire, should be able to choose between circuit-switched delivery or packet-switched delivery via ILEC UNEs. As demonstrated on the next diagram, each method presents several costing scenarios which factor directly into e.spire's ability to provide competitive frame relay services.

☆ Frame relay customer LAN (⊛ Headquarters)

■ CLEC frame relay POP/switch

○ ILEC frame relay POP/switch

* New Mexico is a single LATA state

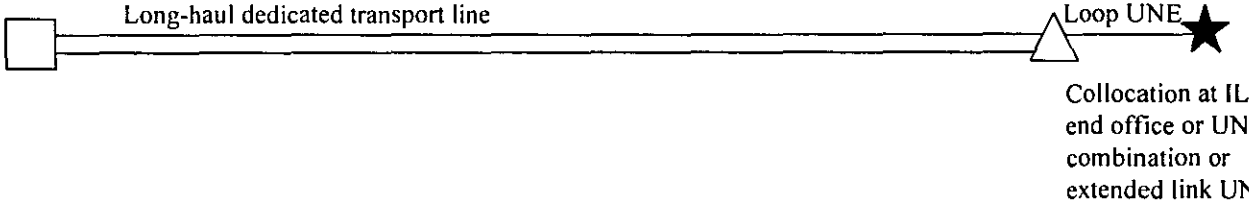
Different delivery options lead to different pricing scenarios

Pricing

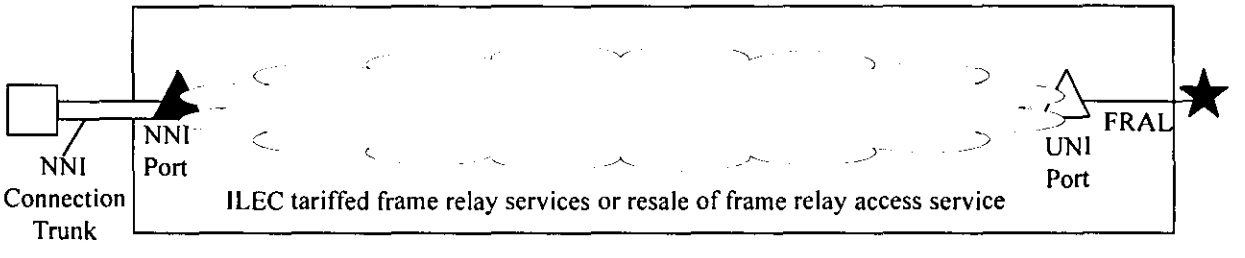
e.spire frame relay switch/POP Albuquerque

Customer LAN Las Cruces

May be efficient, if transport link is short. Prohibitively expensive in most cases where UNE combinations or extended link are not available. Even then, costs may not be comparable to the TELRIC of packet-switched transport.



Tariffed rates are unrelated to cost - do not reflect efficiencies of frame relay networks. Resale costs roughly 30-40% more than UNEs.



TELRIC pricing of ILEC rate elements reflects efficiencies of ILEC network.

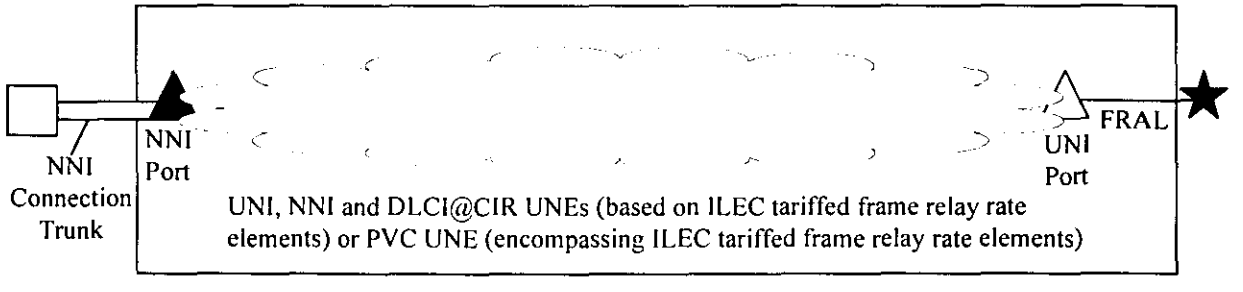


Diagram I

e.spire / Intermedia

Frame Relay and Data UNEs

Position Paper

- Technical overview of frame relay technology and service.
  - Physical components of frame relay service.
  - How a frame relay transmission gets from point A to B – and how fast.
  - Frame relay in terms of the OSI protocol stack.
- Why current arrangements with ILECs are stalling competition and limiting consumer choice in data service providers.
- Specific unbundling proposals: a PVC UNE or specific frame relay UNEs in combination (corresponding to tariffed elements of ILEC frame relay service).
- Frame relay / data UNEs satisfy the "impair" standard.

Diagrams

A Frame relay frame
B Getting to the first frame relay switch
C Frame relay – physical components
D PVCs and ILEC tariffed elements
E Frame relay on the OSI protocol stack
F Connecting frame relay networks to expand the reach of ILEC and CLEC networks
G Frame relay interconnection
H How to get a frame relay customer onto a CLEC's frame relay network
I Different delivery options lead to different pricing scenarios

Appendix

- e.spire frame relay interconnection and UNE arbitration decisions from Arizona, Colorado and New Mexico.
- Frame relay service excerpts from RBOC/GTE FCC access tariffs.

The FCC must extend its implementation of the local competition provisions of the 1996 Act into the packet-switched world.

- The FCC has determined that the Act is technology neutral.
- ILECs are not "new entrants" into packet-switched data transmission markets.
  - ILECs deployed frame relay and other data technologies before the 1996 Act.
  - ILECs have continued to deploy new technologies, even though faced with potential unbundling obligations.
  - By generating additional demand and providing a reasonable profit, unbundling actually encourages ILEC deployment of advanced technologies.
- The ILECs' ubiquitous loop and transport network, enormous embedded customer base, and resulting economies of scale give them distinct and decisive advantages that extend beyond the circuit-switched world.

Frame relay is a packet-based technology that provides a very efficient and reliable means of transporting high-speed, high volume, bursty data between geographically dispersed LANs.

- Frames are like programmable and extendable data boxcars – neither segmentation into standard-sized packets nor protocol conversions are required.

- Physical components of frame relay service include:

  - Customer premise equipment (at both ends of a transmission) known as a Frame Relay Access Device or Frame Relay Assembler/Disassembler (**FRAD**).

  - A loop, extended link or special access circuit known as a Frame Relay Access Link (**FRAL**).

  - Multiplexing equipment known as a Digital Access and Cross-Connect System (**DACS**) used to aggregate DS-0 traffic onto a common T-1 (or DS-1 traffic onto a T-3) headed for a frame relay switch. (~$65,000)

  - A frame relay switch, including User-to-Network Interface Ports (**UNI Port**) and Network-to-Network Interface Ports (**NNI Port**). (~$250,000)

  - DS-3 and OCn transport links.

- Getting from point A to point B is accomplished by assigning Data Link Connection Identifiers (**DLCI**) to each "hop" between two pieces of frame relay equipment (CPE and switches).

  - A string of DLCIs constitute a Permanent Virtual Circuit (**PVC**).

- How fast a transmission travels across the frame relay network is determined by network capacity and engineering. Frame relay service is sold at minimum guaranteed speeds or Committed Information Rates (**CIR**).

Frame relay providers realize cost-efficiencies through the network engineering practice of "oversubscription".

- The shared nature and integrated switching/transport fabric of frame relay networks allows for the assignment of multiple DLCIs to the same transmission link.

- To achieve maximum use of frame relay switching capacity and transport links, DLCIs at varying CIRs generally are assigned to switch/transport links so that the aggregate CIR or capacity commitment is equal to 200% of the capacity of the switch port and transport link.

- Oversubscription factors may be adjusted if unacceptable peak-hour congestion is experienced.

- The practice of oversubscription yields a lower TELRIC for packetized transmission versus shared or dedicated circuit-switched transport over standard high capacity transport links.

e.spire and Intermedia seek access to frame relay and data UNEs in order to fill-out their own advanced frame relay and ATM networks.

- e.spire has deployed 66 data switches nationwide and Intermedia has deployed 175, giving it coverage in most LATAs.

- Frame relay UNEs are essential to CLECs' ability to compete for contracts to provide frame relay services to customers with geographically dispersed LANs.

- e.spire and Intermedia will use frame relay UNEs to provide connectivity between outlying customer LAN locations and their own frame relay switching/transport fabric.

- e.spire and Intermedia will combine frame relay UNEs with their own frame relay network elements to provide a finished service to an end user.

- Although the Arizona Corporation Commission has determined that U S West must make frame relay interconnection and UNEs available to e.spire at TELRIC, frame relay UNEs remain unavailable there and generally are not offered by ILECs anywhere.

- State commission confusion over intra and interLATA jurisdictional issues has left frame relay interconnection a muddled mess. e.spire and Intermedia use a mix of "NNI Agreements" and services ordered out of FCC access tariffs to achieve interconnection so that they can deliver intraLATA and interLATA frame relay traffic to customers on the ILECs' frame relay networks.

    - e.spire and Intermedia provide both intraLATA and interLATA frame relay services – they do not seek interconnection or access to UNEs exclusively to provide exchange access.

The Commission should require ILECs to provide unbundled access at TELRIC-based prices to a PVC UNE or to frame relay UNEs based on the ILECs' tariffed elements for frame relay service.

- Specific frame relay unbundling requirements should include:
    - Frame Relay Access Links (FRALs) – 2- or 4-wire loops in 56 kbps increments or extended links (including DACS multiplexing).
    - Frame Relay Transmission Fabric (integrated switching and DS-3/OCn transport links).
        - Corresponding ILEC tariffed elements for the integrated frame relay switching/transport fabric include:
            - User-to-Network Interface Ports (UNI Ports);
            - Network-to-Network Interface Ports (NNI Ports); and
            - Data Link Connection Identifiers at Committed Information Rates (DLCIs at CIRs).
- Because frame relay UNEs must be offered in combination to be useful, e.spire and Intermedia propose a single PVC UNE encompassing each of the ILECs' tariffed frame relay elements (FRAL, UNI and NNI Ports, DLCI@CIR).
    - A PVC UNE likely would transcend specific packet-based technologies and, thus, would be technology neutral and more broadly applicable than specific frame relay UNEs.
- The FCC should reaffirm that all UNEs, including frame relay and data UNEs, must be priced at TELRIC.
- The FCC should continue to prohibit ILEC- or state commission-imposed restrictions on the use of UNEs.

Cost and time-to-market factors indicate that frame relay UNEs satisfy the "impair" test of Section 251(d)(2). Without unbundled access to frame relay UNEs, e.spire and Intermedia's ability to compete is diminished materially.

- **Network proximity to each of a customer's geographically dispersed LAN locations often translates into a decisive cost-advantage for the ILECs.**

  - The ILECs' ubiquitous customer access, combined with ubiquitously deployed end office, loop and transport facilities, has enabled them to deploy more frame relay switches closer to frame relay customers.

  - While ILECs often are able to take advantage of the cost-efficiencies of a packet-switched network deployed at all customer LAN locations, CLECs that have not extended their frame relay networks to a particular business center must depend on special access, traditional UNEs and collocation, or (if available) extended links to connect a LAN in that business center to its frame relay network and other LANs in another business center.

    - If CLECs are to compete effectively, their costs for packetized transport products must reflect the efficiencies realized by oversubscription.

    - Costs of connecting each LAN, including those on- and off-net, must be factored into competitive bids. If off-net costs are not based on TELRIC that reflects the practice of oversubscription, CLECs may not be able to compete effectively for frame relay customers with geographically dispersed LANs.

  - Resale, even if available at an avoided cost discount, and special access priced in excess of TELRIC do not provide cost-effective alternatives to UNEs.

Impair test (continued) . . .

- **Packet-switched UNEs can provide cost effective alternatives in cases where:**

  - Geographic market characteristics cannot yet justify self-provisioning (~$250,000 for the switch, plus the costs of end office space, installation and collocation (~$50,000));

    - As is the case with traditional UNEs, frame relay/data UNEs can be used as stepping stones toward self-provisioning.

  - Special access incorporates an expensive distance-sensitive transport component;

    - Special access can be an alternative, if prices are set at a TELRIC that reflects the efficiencies of packetized transport.

  - Traditional UNEs require collocation (in addition to a distance-sensitive transport component priced at circuit-switched TELRIC, the expense (~$50,000) and delay (several months to more than a year) of collocation may make a competitive bid impossible);

  - If available, an extended link UNE or combination includes a long transport component priced at circuit-switched TELRIC.

Impair test (continued) . . .

- **Time-to-market: how long of a delay is too long?**

  - In order to compete effectively, a CLEC must be able to offer a competitive bid in roughly the same time and a provisioning interval of roughly the same length as an ILEC.

  - Self-provisioning will engender a delay substantially longer than that involved with use of a PVC UNE or other frame relay UNE combinations (determining the permissibility of combinations may involve additional delay).

  - Without a PVC UNE or frame relay UNE combinations, CLECs may not be able to demonstrate or accumulate sufficient demand to justify the costs of collocation and switch deployment – time-to-market delays could be unpredictable or interminable, either of which would prevent a competitive bid.

  - Delays associated with collocation (from months to more than a year) and additional frame relay switch deployment generally are not experienced by the ILECs.

  - Unless self-provisioning or wholesale alternatives to UNEs are available in a timeframe similar to that which the ILEC itself would need to provision the service, delay-to-market differentials compel unbundling.

Impair test (continued) . . .

- **The FCC's Section 706 mandate and the public interest also compel definition of frame relay/data UNEs.**

  - While frame relay UNEs may not accelerate the pace of competition in rural America, their impact on the small businesses driving today's Internet boom and economic expansion could be dramatic.

  - By generating additional demand and providing a reasonable profit, unbundling actually encourages ILEC deployment of advanced technologies.

  - As in the voice world, frame relay UNEs will extend the reach of competitive facilities-based networks and, thereby, will promote and maximize additional facilities deployment by competitors.

  - Extended reach means more choices for consumers.

  - Extending competitors' reach also will place pressure on ILECs to improve their frame relay service offerings and to move prices down toward cost.